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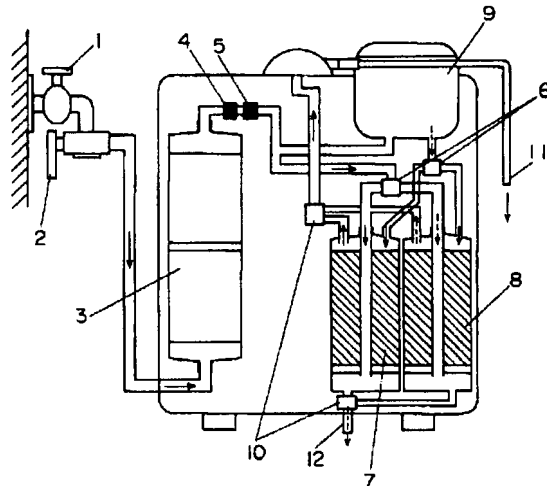
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(54) 【発明の名称】 電池駆動可搬式軟水化装置

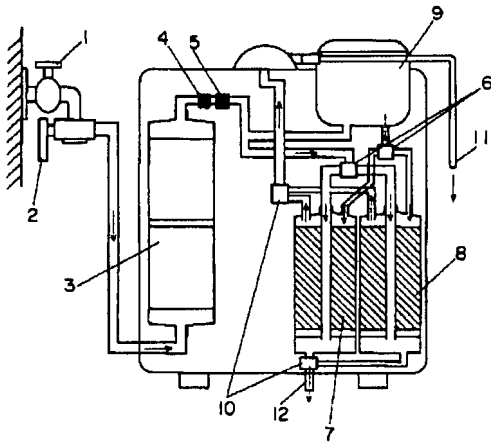
(57) 【要約】

【目的】 本発明は、操作性に優れ、どこにでも持ち運べ、小型で消費電力が小さく一般家庭にまで普及しうる電池駆動可搬式軟水化装置を提供することを目的とする。

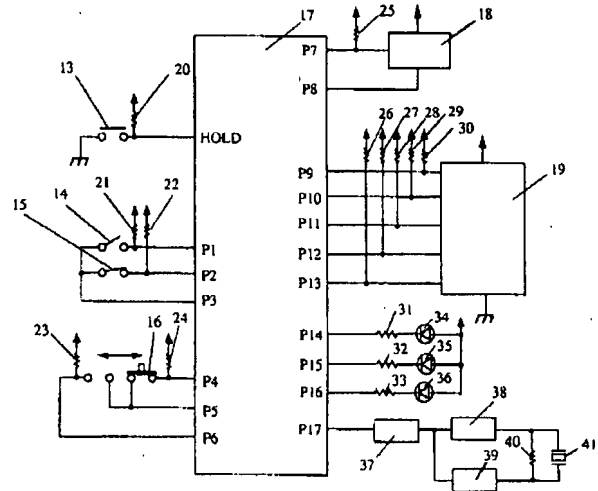
【構成】 本発明の電池駆動可搬式軟水化装置は、原水供給管と再生液を満たした再生用タンク9に流路切替弁6、10を介して接続された複数のイオン交換樹脂カートリッジ7、8と、原水供給管に設けられた通水センサ4と、通水センサ4からの信号が給水信号であるとき回路電流を供給し、止水信号であるとき回路電流を供給しない電力モード切り替え制御手段とを備えたものである。



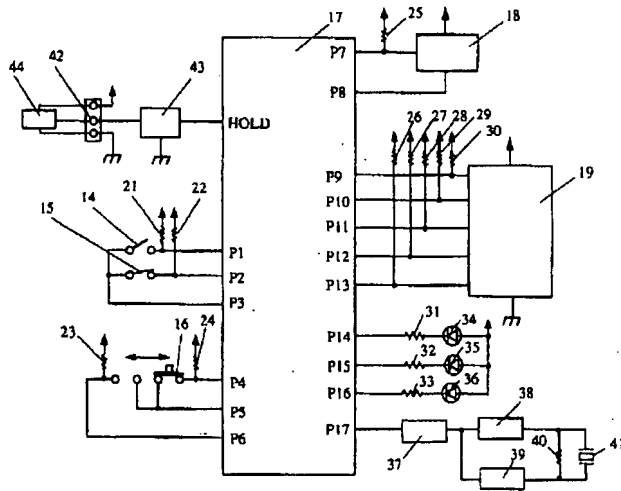
【図1】



【図2】



【図3】



* NOTICES *

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the softening equipment which softens raw water, especially cell actuation portable-type softening equipment.

[0002]

[Description of the Prior Art] It is [water] indispensable to everyday life, and it is used casually usually. However, since meal culture has been substantial in our country, various needs are increasingly brought near also to this water that did not try to return so much until now. This is remarkable in especially the city section. Because, although water, such as a river, is purified and supplied to the suburbs in the comparatively small-scale purification plant by which distributed installation was carried out when it is many since a lot of water is consumed in the city section It is because most things [things] that each amount of water which should be purified is extensive influences, the water quality of the water supplied from this decentralized purification plant is taken into consideration to delicacy, and it purifies over many hours thoroughly are not done. For this reason, the actual condition is that water quality has not resulted by extent to which the taste of human being of the city section which had opening [good] is satisfied. Supposing it changes as it is, it will be expected that a limitation surely exists in the water quality offered from purification plant in respect of delicacy. It seems that and there is no noticeable motion which tackles the water quality improvement taken into consideration to delicacy as an inclination at present. The places out of which are equipped with a water purifier or softening equipment at the home in the area which cannot but receive supply of the water which is not delicious from such a reason in the operation of the restaurant which needs delicious water, an enterprise, etc., and it comes to self-defense are increasing in number. Although this water purifier removes and purifies residual chlorine with filter media, such as activated carbon, neither calcium nor magnesium can remove it. Softening equipment removes this ion, i.e., calcium²⁺, and Mg²⁺ ion using ion exchange resin, softens hard water, and increases delicacy. In addition, the running water machine which adds a mineral component further is also devised.

[0003] By the way, as for the problem of hard water and soft water, only the field of delicacy does not become a problem although stated centering on the field of the delicacy of water until now. In washing of industrial use etc., hard water not only spoils the delicacy as potable water, but has brought another problem to washing of wash, tableware washing, etc., and a pan. namely, hard water becomes the hindrance of washing in itself -- in addition, it is leaving an impurity, when calcium²⁺ and Mg²⁺ ion are made to remain on a washed object front face, appearance is spoiled and you need [and] purity after washing. The expectation for softening equipment also from such a point is great.

[0004] For example, the dish washer with a water softener furnished with conventional softening equipment is indicated by JP,62-112523,A. although it is often experiencing in case tableware is washed -- a dish washer -- washing and a rinse -- ending -- that time -- dramatically -- beautiful -- finish -- **** -- even if it seems to be, if it often [after washed objects, such as a pan, get dry] sees, many white spots may remain in the front face It is doing which calcium and magnesium in water make as stated above,

and this remains after calcium's and magnesium's underwater [these] drying, it serves as a spot and remains. Although what is necessary is just to install softening equipment in order to solve this, here is one problem. That is, since capacity falls gradually in the process in which hard water is softened, in order to carry out long duration operation, regenerating periodically is indispensable to the ion exchange resin used with softening equipment. However, the period which performs this regeneration must stop operation of softening equipment temporarily. The operation effectiveness of softening equipment cannot but fall. Even so, if it is going to gather operation effectiveness by force, the problem of degree-of-hardness leakage will arise. So, with the conventional technique indicated by this JP,62-112523,A, the water softener which consists of two ion exchange resin was formed, and if a long duration dish washer will be operated and the ion exchange resin of one water softener will be in a saturation state with calcium or magnesium, it has changed to the ion exchange resin of the water softener of another side. If count operation of predetermined of the dish washer is carried out for while and a water softener loses the soft water extraction capacity, a control circuit will change automatically the solenoid valve of the inlet port of two water softeners, and an outlet. It can continue continuously, without stopping operation of a dish washer by this. In addition, although there is also a raw water softening processor given in JP,3-12287,A as a conventional technique, this is the same as that of the conventional technique and basic target which were indicated by JP,62-112523,A, and gathers the operation effectiveness of a raw water softening processor by change.

[0005] However, not all the conventional softening equipments represented by such JP,62-112523,A and JP,3-12287,A could use softening equipment, but sensed inconvenient in the location which does not use a source power supply and cannot use a source power supply in many cases. Moreover, there was a source power supply, also when an electrical potential difference and a frequency changed with areas and were not able to use special softening equipment. However, even if it thinks that this will be made into the thing of a portable type, the situation which cannot realize it promptly exists with the softening equipment of a conventional type. That is, it is because a large-sized cell or a changing battery must be frequently performed even if one of the reasons conventional softening equipment cannot but use this equipment by the source power supply has consumption of power too large for driving this equipment by the cell and it performs this, so it did not become what is equal to practical use. Moreover, in the conventional technique, in consideration of operability, the solenoid valve was performing the passage change automatically like JP,62-112523,A and a JP,3-12287,A publication, since a solenoid valve was driven, the still bigger current needed to be passed, and the power source had to be taken from the source power supply.

[0006] moreover, electrical-potential-difference conversion since this source power supply is used -- it is necessary to carry out -- equipment itself -- there was also a problem that it could not but become large. When using a solenoid valve, it is still more so. And these were set also to one of the motive power which pushes up the manufacturing cost of softening equipment. In addition, it was what cannot disregard the electric dues at the time of this softening equipment activity, either.

[0007]

[Problem(s) to be Solved by the Invention] Thus, conventional softening equipment has power consumption in the situation for which it cannot but depend on a source power supply greatly, and, so, difficult ** of the implementation of portable-type softening equipment was carried out as a matter of fact. And in order to use a source power supply, the transformer etc. needed to be equipped separately, and the inclination which equipment enlarges was suited. Moreover, in order to perform this equipment, the manufacturing cost increased, and it had refused for softening equipment to spread even through each home. It was that it is important for a domestic activity to also lower electric dues.

[0008] This invention solves such a conventional trouble and can carry it anywhere, and it is small and aims at offering the small cell actuation portable-type softening equipment of power consumption.

[0009] Moreover, this invention is excellent in operability, can be carried anywhere, and it is small and it aims at offering the cell actuation portable-type softening equipment with which power consumption may spread even through ordinary homes small.

[0010]

[Means for Solving the Problem] In order to attain this technical problem, the cell actuation portable-type softening equipment of this invention supplied a circuit current, when the signal from two or more ion-exchange-resin cartridges connected to the tank for playback through the passage selector valve, the water-flow sensor formed in the raw-water supply pipe, and a water-flow sensor is a feed-water signal, and when it is a water-cutoff signal, it has provide a technical means have the power mode change control means which does not supply a circuit current. In addition, not supplying this circuit current contains that to which the feeble current of extent which cannot say that other currents are flowing flows, although a current does not flow at all. It is suitable for a water flow sensor that it is a pressure switch. Moreover, a water flow switch may be a flow rate sensor. And it has a water purification cartridge and it is desirable for regenerant to be brine.

[0011] Moreover, by comparing with the accumulating-totals time and setting-out time which were measured with the timer, the cell actuation portable-type softening equipment of this invention judges that the playback stage is coming, and it is appropriate for it for a display means to have the playback demand display-control means which indicates by playback demand.

[0012] The cell actuation portable-type softening equipment of this invention is periodically equipped with the storage element of the non-volatile which memorizes an equipment busy condition at the time of water cutoff and feed water. It is appropriate for this equipment busy condition that either the activity of an ion-exchange resin cartridge, a playback condition, the content of a display of a display means, the existence of an alarm, the amount of water flow or an accumulating-totals time is included.

[0013]

[Function] The cell actuation portable-type softening equipment of this invention supplies a circuit current, when the signal from the water flow sensor formed in the raw water supply pipe and a water flow sensor is a feed water signal, since it is equipped with the power mode change control means which does not supply a circuit current when it is a water cutoff signal, can be driven with necessary minimum power consumption, and can make it a compact configuration. Since a pressure switch detects a water flow stage, it is detectable to accuracy easily. If a flow rate switch detects, detection precision can be raised further. It has a water purification cartridge, and since regenerant is brine, water can be purified and regenerant is also cheap.

[0014] Since it has the playback demand display-control means which indicates by playback demand for the display means while judging a playback stage, it excels in operability. Moreover, since it has the storage element of the non-volatile which memorizes an equipment busy condition periodically at the time of water cutoff and feed water, suitable operation is enabled, reducing power consumption.

[0015]

[Example] Hereafter, it explains, referring to a drawing about one example of the cell actuation portable-type softening equipment of this invention. The schematic diagram of the circuitry of the cell actuation portable-type softening equipment in other examples of this invention is shown in drawing 1 at the schematic diagram of the circuitry of cell actuation portable-type softening equipment [in / for the whole cell actuation portable-type softening equipment block diagram in one example of this invention / one example of this invention], and drawing 3 at drawing 2 .

[0016] For 1, as for a water switch and 3, in drawing 1 , waterworks bibcock and 2 are [a water purification cartridge and 4] water flow sensors. Moreover, it is the passage selector valve which, as for 5, the constant flow rate valve interlocked with, and, as for 6 and 10, two were interlocked with, and 7 is an ion-exchange resin cartridge (A), and 8 is an ion-exchange resin cartridge (B). And 9 is a tank for playback, and a brine exhaust pipe for [11] playback in the soft water discharge tube and 12.

[0017] Overall actuation of the cell actuation portable-type softening equipment of this example is explained using drawing 1 . If the waterworks bibcock 1 is unstopped and the water switch 2 is changed in the open direction, water will flow like an arrow head and will pass the water purification cartridge 3. Tap water has residual chlorine removed, is purified, and is breathed out by the raw water supply pipe here. If the water flow sensor 4 by which the purified water which was breathed out from this water purification cartridge 3 was prepared in the raw water supply pipe is passed, the water flow sensor 4 will be operated with water pressure. water -- further -- constant -- a flow rate -- a valve -- five -- pass --

passage -- a selector valve -- six -- alternation -- changing -- having -- ion-exchange resin -- a cartridge -
 - (-- A --) -- seven -- or -- ion-exchange resin -- a cartridge -- (-- B --) -- eight -- either -- supplying --
 having . And in addition to this, water is shunted on the way, and is supplied also to the tank 9 for
 playback with which the regenerant for reproducing ion exchange resin was filled in part.

[0018] the passage selector valve 10 which the water supplied to the ion-exchange resin cartridge (A) 7
 was removed and softened in the hardness component (Mg^{2+} , calcium $^{2+}$ ion) by the passage selector
 valve 6 by the operation of ion-exchange resin, and was interlocked with the passage selector valve 6 --
 a passage -- the regurgitation [the soft water discharge tube 11 to soft water] -- it carries out. Although
 it changes manually, if the passage selector valve 6 has small power consumption, it is natural. [of your
 being what is automatically changed with actuation of the water flow sensor 4]

[0019] The water supplied to the tank 9 for playback for reproducing ion exchange resin at this time in
 part on the other hand dissolves the salt beforehand thrown in in the tank 9 for playback, turns into brine
 which is regenerant, and is supplied to the ion-exchange-resin cartridge (B) 8 by the passage selector
 valve 10. Playback of the ion-exchange resin cartridge (B) 8 is performed as follows. That is, it is
 exchanged for Na^{+} ion in brine, and Mg^{2+} and the calcium $^{2+}$ ion by which the ion-exchange resin
 cartridge (B) 8 is adsorbed are reproduced to the original condition of the ion-exchange resin cartridge
 (B) 8. The brine used for playback of the ion-exchange resin cartridge (B) 8 will be discharged from the
 brine exhaust pipe 12.

[0020] by the way -- ion-exchange resin -- a cartridge -- (-- A --) -- seven -- ion-exchange resin -- a
 cartridge -- (-- B --) -- eight -- a change -- playback -- a stage -- having reached -- the time -- carrying
 out -- having -- although -- this -- playback -- a stage -- decision -- playback -- a demand -- a display
 control -- a means -- it is -- a postscript -- carrying out -- a microcomputer -- 17 -- a timer -- having
 measured -- water flow -- time amount -- namely, -- water flow -- a sensor -- four -- operating time --
 having integrated -- accumulating totals -- a time -- the setup time -- comparing -- things -- judging . In
 addition, this accumulating-totals time is memorized by the storage element (EEPROM) 19 of the non-
 volatile which carries out a postscript, being updated. And one and the buzzer 41 of light emitting diodes
 34-36 which are the display means which carries out a postscript are made to give a playback demand
 indication of the microcomputer 17 which is a playback demand display-control means further. or [that
 a playback demand display makes one of the light emitting diodes 34-36 emit light (flash)] -- or it
 carries out by carrying out buzzer dispatch. Two of light emitting diodes 34-36 remaining perform a
 battery life and the display of a working thing.

[0021] Next, based on drawing 2 , the circuitry of the cell actuation portable-type softening equipment
 by this example is explained. As for the electric contact switch of the pressure switch whose 13 is the
 water flow sensor 4, and 14, an ion-exchange resin cartridge (A) pilot switch and 15 are ion-exchange
 resin cartridge (B) pilot switches. As for a water flow time setting circuit changing switch and 17, 16 is
 [a microcomputer and 18] ICs. This IC18 is an integrated circuit which detects supply voltage, i.e., the
 voltage level of a cell. 19 -- the storage element (EEPROM) of a non-volatile, and 20-33 -- for an
 oscillator circuit and 38, as for a negative electrical-potential-difference creation circuit and 40, a current
 amplification circuit and 39 are [resistance, and 34-36 / light emitting diode and 37 / the resistance for
 matching and 41] buzzers. A series of members applied to the resistance 40 for matching constitute the
 actuation circuit of a buzzer 41 from this oscillator circuit 37. Moreover, the HOLD input port for the
 change of low-power mode and a mode of operation in HOLD of a microcomputer 17, and P1-P17 are
 the input/output port. Ports P3, P5, and P8 are all output ports, and P1, P2, P4, P6, and P7 are input port.
 Moreover, P9, P10, P11, P12, and P13 are ports which exchange the storage element (EEPROM) 19 and
 data of a non-volatile, and are a port for the object for write-in enabling signals, the object for clocked
 into, the object for input data, the object for output data, and Ready/Busy signals in order. Moreover,
 P14 to P16 is a port for driving the light emitting diodes 34-36 which are display means. And P17 is a
 port for buzzer dispatch.

[0022] If the waterworks bibcock 1 is unstopped, water flows like an arrow head, the water purification
 cartridge 3 is passed and the pressure switch which is the water flow sensor 4 is reached, with water
 pressure, the electric contact switch 13 of a pressure switch given in drawing 2 will be pushed, and a

contact will be connected. Then, since the voltage level of the HOLD input port of a microcomputer 17 is set to 'L' from 'H', a microcomputer 17 will be changed from low-power mode to a mode of operation. Although the consumed electric current of the microcomputer 17 in low-power mode is an average of 0.5microA, this changes to an average of 3mA in a mode of operation. At this time, all of the voltage level of ports P3, P5, and P8 are set to 'L' level from 'H', and a current will flow in the ion-exchange resin cartridge (A) pilot switch 14, the ion-exchange resin cartridge (B) pilot switch 15, the water flow time setting circuit changing switch 16, and IC18.

[0023] This ion-exchange resin cartridge (A) pilot switch 14 and the ion-exchange resin cartridge (B) pilot switch 15 are switches currently interlocked with the passage selector valves 6 and 10 which change the channel for the change of the ion-exchange resin cartridge (A) 7 of drawing 1, and the ion-exchange resin cartridge (B) 8. For this reason, another side will be turned off if either turns on the ion-exchange resin cartridge (A) pilot switch 14 and the ion-exchange resin cartridge (B) pilot switch 15. When the output of a port P3 is set to 'L', therefore, in the ion-exchange resin cartridge (B) pilot switch 15 and resistance 22 Since the ion-exchange resin cartridge (A) pilot switch 14 or resistance 21 flows this -- a power source -- it is -- a cell -- from -- a circuit -- a current -- a port -- P -- three -- supplying -- having -- ion-exchange resin -- a cartridge -- (-- A --) -- seven -- ion-exchange resin -- a cartridge -- (-- B --) -- eight -- any -- using it -- having -- **** -- or -- a port -- P -- one -- P -- two -- being detectable -- ***** . However, when the output of a port P3 is set to 'H', a circuit current will not be supplied to a port P3, and the consumed electric current will be stopped. In addition, not being supplied contains [this] that to which the feeble current of extent which cannot be said that the current is flowing is flowing outside, although a current does not flow at all. In the case of this example, when this feeble current flows, it hits.

[0024] The water flow time setting circuit changing switch 16 is a switch for changing setting out of water flow time amount, can make three kinds of conditions of input port P4 and P6, and makes three kinds of time setting possible. Moreover, IC18 is the integrated circuit which detects supply voltage, i.e., the voltage level of a cell, and a microcomputer 17 judges this by voltage-level 'L' of input port P7, and 'H'. A result is memorized by the storage element (EEPROM) 19 of a non-volatile. In addition, voltage-level detection of cell voltage is judged only at the time of water flow. That is, although the output port P8 of a microcomputer 17 is set to 'L' at the time of a mode of operation and he is trying for a current to flow in IC18, at the time of low-power mode, he sets the voltage level of HOLD input port to 'H', and is trying to stop the consumed electric current.

[0025] A microcomputer 17 performs a mode change in one of the modes of low-power mode and a mode of operation with the voltage level of HOLD input port so that the above explanation may show. That is, a microcomputer 17 is a power mode change control means. When HOLD input port is 'H' and it is low-power mode and 'L', it becomes a mode of operation.

[0026] Next, actuation of the microcomputer 17 in low-power mode is explained. In low-power mode, all of the voltage level of the output ports P3, P5, and P8 given in drawing 2 are controlled by 'H' level. While this is not letting water flow to the cell actuation portable-type softening equipment of this example, the microcomputer 17 can maintain the ion-exchange resin cartridge (A) pilot switch 14, the ion-exchange resin cartridge (B) pilot switch 15, the water flow time setting circuit changing switch 16, and IC18 at the condition that a current does not flow.

[0027] By the way, when it changes to a mode of operation again, it is necessary to make it as for the cell actuation portable-type softening equipment of this example, a user understand the equipment busy condition of this equipment promptly in order to operate also in low-power mode. Although it is necessary to memorize the equipment busy condition of this equipment also under low-power mode to realize this, under low-power mode, it is difficult to memorize with the usual volatile storage means. Then, the following means are provided in the cell actuation portable-type softening equipment of this example. namely, -- this -- equipment -- setting -- two -- ** -- ion-exchange resin -- a cartridge -- (-- A --) -- seven -- ion-exchange resin -- a cartridge -- (-- B --) -- eight -- which -- using it -- **** -- a thing -- water flow -- an amount -- an alarm -- existence -- etc. -- equipment -- a busy condition -- water cutoff -- the time -- and -- water flow -- inside -- periodical -- a non-volatile -- a storage element (EEPROM) --

19 -- memorizing -- **** . In addition, the content of a display displayed on just before [at the time of establishing display means, such as liquid crystal, independently], the accumulating-totals time integrated while being updated with an activity are contained in an equipment busy condition. Therefore, it always is not necessary to pass a current to the cell actuation portable-type softening equipment of this example, and power consumption can be made low. Although a display means is made to give a playback demand indication of the microcomputer 17 which is a playback demand display-control means to judging a playback stage using this storage and a playback stage coming, this is as having already explained.

[0028] Now, it explains how many battery lives are prolonged by the change in the power consumption mode of this example. Although the consumed electric current of this example is using the supply voltage of 4.5V, it is 14.7microA under low-power mode. And for example, the electric contact switch 13 of a pressure switch is the basis of the mode of operation of the conditions which the input port P4 where another side chose OFF and the time setting of long duration in either ON, the ion-exchange resin cartridge (A) pilot switch 14 or the ion-exchange resin cartridge (B) pilot switch 15 calls 'L' at ON, and input port P6 calls 'H', and the consumed electric current is 10.05mA. And when the amount of water flow on the 1st shall be set to 20 (l./day) as average water consumption and it shall be restricted to a flow rate 3 (a part for 1./) by the constant flow rate valve 5, it is $\{20 \text{ (l./day)} / 3 \text{ (part for 1./)}\} \times 365 \text{ (day/year)} = 2433 \text{ (minute/year)} = 40.6 \text{ (an hour/year)}$.

It comes out, and it is, it will see on the average, and per [40.6 (time amount)] year will use the cell actuation portable-type softening equipment of this example. Then, the power consumed at this time is $10.05 \text{ (mA)} \times 40.6 \text{ (time amount)} = 408.0 \text{ (mA time amount)}$.

It becomes. The capacity of an average manganese cell is $1080 \text{ (mA time amount)} / \{365 \text{ (Sun.)} \times 24 \text{ (hour/day)}\} = 0.123 \text{ (mA)} = 123 \text{ (muA)}$, in order to attain rule-of-thumb one year of a battery life when not changing power consumption mode since it is about 1080 (mA time amount).

***** is needed. If the consumed electric current is not held down to below 123 (muA), a battery life will be exhausted within one year. As already stated, since the consumed electric current at the time of a mode of operation is 10.05mA, it cannot attain battery life one year at all. However, since it can change to low-power mode and the consumed electric current can be held down to 14.7microA when not using it in this example, a battery life can be prolonged. And according to the experiment, it became possible to carry out a battery life also under severe conditions in about 1.2 compared with the real service condition of the flash of a light emitting diode, buzzer continuation, and low-temperature actuation. On anticipated-use conditions, the battery life for about two years is expectable that the above-mentioned power also shows.

[0029] Next, based on drawing 3, the circuitry of the cell actuation portable-type softener by another example is explained. Only the place of a configuration of having differed, since the same configuration was shown explains the member of the same sign as drawing 2, and explanation of the same configuration is omitted. The water flow sensor 4 is the amount sensor 44 of field unification of this example. 42 is a flow rate sensor input terminal, and 43 is a filter circuit. If a flow rate sensor 44 rotates a raw water supply pipe according to the flowing stream, a pulse signal will occur in proportion to a rotational frequency, and it will be inputted into the HOLD input port of a microcomputer 17 through a filter circuit 43. A microcomputer 17 is changed from low-power mode to a mode of operation by the rising edge of this pulse signal. After changing to a mode of operation, it is the same as that of the case of drawing 2. In the case of this example, a water flow stage can be detected with a very sufficient precision, and by this, a flow rate sensor 44 can stop the consumed electric current, and can prolong a battery life.

[0030]

[Effect of the Invention] This invention supplies a circuit current, when the signal from a water flow sensor is a feed water signal, since it is equipped with the power mode change control means which does not supply a circuit current when it is a water cutoff signal, cell actuation of it can be carried out with necessary minimum power consumption, can be united, and can make it a compact configuration. Therefore, it can carry and do anywhere. Since water flow is judged with a pressure switch or a flow rate

switch, it is detectable to easy and accuracy. Since it furthermore has a water purification cartridge and reproduces with brine, water can be united and purified and regenerant can be low-cost-ized.

[0031] Since a playback demand display-control means makes a display means indicate by playback demand while judging a playback stage, softening equipment excellent in operability can be offered. Moreover, since it has the storage element of the non-volatile which memorizes an equipment busy condition periodically at the time of water cutoff and feed water, suitable operation can be carried out even if it reduces power consumption. Moreover, as an equipment busy condition, since either the activity of an ion-exchange resin cartridge, a playback condition, the content of a display of a display means, the existence of an alarm, the amount of water flow or the accumulating-totals time is included, operability is excellent and suitable operation can be carried out.

[0032] The cell actuation portable-type softening equipment of this invention is cheap, and user-friendliness makes it possible to spread softening equipment through a good general home.

[Translation done.]